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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/955,076	09/19/2001	Eiji Sakagami	214019US2	9771

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EXAMINER	
WEISS, HOWARD	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 12/26/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/955,076	SAKAGAMI, EIJI	
	Examin r	Art Unit	
	Howard Weiss	2814	MW

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) *7-21* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-21* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Attorney's Docket Number: 214019US2
Filing Date: 9/19/01
Continuing Data: RCE established 5/8/03
Claimed Foreign Priority Date: 9/21/00 (JPX)
Applicant(s): Sakagami

Examiner: Howard Weiss

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1 to 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 states that the charge storage layer is restricted from the element isolation region and that the width of the charge storage layer corresponds to a width of the element region and a thickness of the bottom insulating film. However, the element isolation region is the width of the trench including the width of the bottom insulating film. These limitations seem to be exclusive of each other since the charge storage layer would not be restricted from the element isolation region as shown in Figure 9 of the Specification.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura et al. (U.S. Patent No. 6,255,166), Pradeep et al. (U.S. Patent No. 6,228,713) and Jang et al. (U.S. Patent No. 5,786,262).

Ogura et al. show most aspects of the instant invention (e.g. Figure 1) including:

- a semiconductor substrate **10**
- a first transistor used as a cell transistor including a first gate insulating film **132** and a first gate electrode **142**
- a second transistor used as a selection transistor including a second gate insulating film **131** and a second gate electrode **141**
- said first gate insulating film comprising a charge storage layer **132b** made of silicon nitride or tantalum oxide with top **132c** and bottom **132a** layers of silicon oxide and said charge storage layer existing only below the first gate electrode in an element region

Ogura et al. do not show the first and second transistor isolated by a trench, a bottom insulating film formed on the trench inner surface and an insulating layer filling said trench on said bottom insulating layer, said charge storage layer restricted from an element isolation region, the height of the charge storage layer above the substrate lower than the height of the material filling said trench and the width of the charge storage layer corresponding to a width of the element region and a thickness of the bottom insulating film.

Pradeep et al. teach (e.g. Figure 7A) to isolate memory cells with trench isolations **24** in element isolation regions with the charge storage layer **14** with a height lower than the trench isolations and restricted from said element isolation regions to reduce the masking and etching steps and create a self-aligned structure (Column 1 Lines 49 to 53). It would have been obvious to a person of ordinary skill in the art at the time of invention to isolate memory cells with trench isolations in element isolation regions with the charge storage layer with a height lower than the trench isolations and restricted from said element isolation regions as taught by Pradeep et al. in the device of Ogura et al. to reduce the masking and etching steps and create a self-aligned structure.

Jang et al. teach (e.g. Figure 10) to form a bottom insulating layer **14** in a trench's inner surface **10** (Figure 8) to provide better isolation (Column 4 Lines 31 to 38). The Examiner notes that the position of the bottom insulating layer of Jang et al. when combined with the features of Ogura et al. and Pradeep et al., as detailed above, the width of the charge storage layer will correspond to a width of an element region and a thickness of the bottom insulating film. It would have been obvious to a person of ordinary skill in the art at the time of invention to form a bottom insulating layer in a trench's inner surface so the width of the charge storage layer will correspond to a width of an element region and a thickness of the bottom insulating film as taught by Jang et al. in the device of Ogura et al. and Pradeep et al. to provide better isolation.

5. Claims 2, 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura et al., Pradeep et al. and Jang et al., as applied to Claim 1 above, and further in view of Reisinger.

Ogura et al., Pradeep et al. and Jang et al. show most aspects of the instant invention (Paragraph 4) except for the thickness ranges and that the thickness of the bottom oxide layer is smaller than the top oxide layer. Reisinger teaches (e.g. Figure 1 and Column 5 Lines 45 to 56) to form a triple layer gate insulating layer **5** wit the thicknesses within the claimed ranges and with the thickness of the bottom oxide layer **51** is smaller than the top oxide layer **53** to increase storage density and data retention (Column 2 Lines 7 to 12). It would have been obvious to a person of ordinary skill in the art at the time of invention to form a triple layer gate insulating layer wit the thicknesses within the claimed ranges and with the thickness of the bottom oxide layer is smaller than the top oxide layer as taught by Reisinger in the device of Ogura et al., Pradeep et al. and Jang et al. to increase storage density and data retention.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura et al., Pradeep et al., Jang et al. and Reisinger, as applied to Claim 1 above, and further in view of Agarwal et al. (U.S. Patent No. 6,201,276)

   Ogura et al., Pradeep et al., Jang et al. and Reisinger disclose the claimed invention (Paragraph 5) except that the charge storage layer comprising either a silicon nitride or a tantalum oxide film instead of either a strontium titanate or a barium strontium titanate film. Agarwal et al. teach (Column 4 Lines 33 to 36) that either a strontium titinate or a barium strontium titanate film are equivalent structure known in the art. Therefore, because these charge storage films were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute either silicon nitride or tantalum oxide for strontium titinate or barium strontium titanate.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura et al., Pradeep et al. and Jang et al., as applied to Claim 1 above, and further in view of Fang (U.S. Patent No. 6,023,085).

   Ogura et al., Pradeep et al. and Jang et al. show most aspects of the instant invention (Paragraph 4) except for the first peripheral transistor consisting of a third gate insulating film and a third gate electrode and a second peripheral transistor consisting of a fourth gate insulating film and a fourth gate electrode and the thicknesses of the third and fourth gate insulating film being different. Fang teaches (e.g. Figure 9H) to have peripheral transistors **332, 342** with gate electrodes **338** and gate insulting films **337,336** of different thicknesses to improve performance and reliability while simplifying manufacture (Column 2 Lines 51 to 54). It would have been obvious to a person of ordinary skill in the art at the time of invention to have peripheral transistors with gate electrodes and gate insulting films of different thicknesses as taught by Fang in the device of Ogura et al., Pradeep et al. and Jang et al. to improve performance and reliability while simplifying manufacture.

Response to Arguments

8. Applicant's arguments with respect to Claims 1 to 6 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hwang et al. (U.S. Patent No. 6,329,266) and Fahey et al. (U.S. Patent No. 5,447,884) teach the use of bottom insulating layers in trench isolations.

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814

applications. The official TC2800 Before-Final, **(703) 872-9318,** and After-Final, **(703)-872-9319** Fax numbers will provide the fax sender with an auto-reply fax verifying receipt of their fax by the USPTO.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(571) 272-1720** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via **Howard.Weiss@uspto.gov**.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group 2800 Receptionist at **(703) 308-0956**.

13. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/ 324,326	thru 12/17/03
Other Documentation: none	
Electronic Database(s): EAST	thru 12/17/03

HW/hw
18 December 2003

Howard Weiss
Examiner
Art Unit 2814

LONG PHAM
PRIMARY EXAMINER